

§ 98.193 Calculating GHG emissions.

You must calculate and report the annual process CO₂ emissions from all lime kilns combined using the procedure in paragraphs (a) and (b) of this section.

(a) If all lime kilns meet the conditions specified in § 98.33(b)(4)(ii) or (iii), you must calculate and report under this subpart the combined process and combustion CO₂ emissions from all lime kilns by operating and maintaining a CEMS to measure CO₂ emissions according to the Tier 4 Calculation Methodology specified in § 98.33(a)(4) and all associated requirements for Tier 4 in subpart C of this part (General Stationary Fuel Combustion Sources).

(b) If CEMS are not required to be used to determine CO₂ emissions from all lime kilns under paragraph (a) of this section, then you must calculate and report the process and combustion CO₂ emissions from the lime kilns by

using the procedures in either paragraph (b)(1) or (b)(2) of this section.

(b) * * *

(1) Calculate and report under this subpart the combined process and combustion CO₂ emissions from all lime kilns by operating and maintaining a CEMS to measure CO₂ emissions from all lime kilns according to the Tier 4 Calculation Methodology specified in § 98.33(a)(4) and all associated requirements for Tier 4 in subpart C of this part (General Stationary Fuel Combustion Sources).

(2) Calculate and report process and combustion CO₂ emissions from all lime kilns separately using the procedures specified in paragraphs (b)(2)(i) through (v) of this section.

(i) You must calculate a monthly emission factor for each type of lime produced using Equation S-1 of this section. Calcium oxide and magnesium oxide content must be analyzed monthly for each lime product type that is produced:

$$EF_{LIME,i,n} = \left[(SR_{CaO} * CaO_{i,n}) + (SR_{MgO} * MgO_{i,n}) \right] * \frac{2000}{2205} \quad (\text{Eq. S-1})$$

Where:

EF_{LIME,i,n} = Emission factor for lime type i, for month n (metric tons CO₂/ton lime).

SR_{CaO} = Stoichiometric ratio of CO₂ and CaO for calcium carbonate [see Table S-1 of this subpart] (metric tons CO₂/metric tons CaO).

SR_{MgO} = Stoichiometric ratio of CO₂ and MgO for magnesium carbonate (See Table S-1 of this subpart) (metric tons CO₂/metric tons MgO).

CaO_{i,n} = Calcium oxide content for lime type i, for month n, determined according to

§ 98.194(c) (metric tons CaO/metric ton lime).

MgO_{i,n} = Magnesium oxide content for lime type i, for month n, determined according to § 98.194(c) (metric tons MgO/metric ton lime).

2000/2205 = Conversion factor for tons to metric tons.

(ii) You must calculate a monthly emission factor for each type of calcined byproduct or waste sold (including lime kiln dust) using Equation S-2 of this section:

$$EF_{LKD,i,n} = \left[(SR_{CaO} * CaO_{LKD,i,n}) + (SR_{MgO} * MgO_{LKD,i,n}) \right] * \frac{2000}{2205} \quad (\text{Eq. S-2})$$

Where:

EF_{LKD,i,n} = Emission factor for calcined lime byproduct/waste type i sold, for month n (metric tons CO₂/ton lime byproduct).

SR_{CaO} = Stoichiometric ratio of CO₂ and CaO for calcium carbonate (see Table S-1 of

this subpart) (metric tons CO₂/metric tons CaO).

SR_{MgO} = Stoichiometric ratio of CO₂ and MgO for magnesium carbonate (See Table S-1 of this subpart) (metric tons CO₂/metric tons MgO).

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$CaO_{LKD,i,n}$ = Calcium oxide content for calcined lime byproduct/waste type i sold, for month n (metric tons CaO/metric ton lime).

$MgO_{LKD,i,n}$ = Magnesium oxide content for calcined lime byproduct/waste type i sold, for month n (metric tons MgO/metric ton lime).

2000/2205 = Conversion factor for tons to metric tons.

(iii) You must calculate the annual CO_2 emissions from each type of calcined byproduct or waste that is not sold (including lime kiln dust and scrubber sludge) using Equation S-3 of this section:

$$E_{waste,i} = \left[(SR_{CaO} * CaO_{waste,i}) + (SR_{MgO} * MgO_{waste,i}) \right] * M_{waste,i} * \frac{2000}{2205} \quad (\text{Eq. S-3})$$

Where:

$E_{waste,i}$ = Annual CO_2 emissions for calcined lime byproduct or waste type i that is not sold (metric tons CO_2).

SR_{CaO} = Stoichiometric ratio of CO_2 and CaO for calcium carbonate (see Table S-1 of this subpart) (metric tons CO_2 /metric tons CaO).

SR_{MgO} = Stoichiometric ratio of CO_2 and MgO for magnesium carbonate (See Table S-1 of this subpart) (metric tons CO_2 /metric tons MgO).

$CaO_{waste,i}$ = Calcium oxide content for calcined lime byproduct or waste type i

that is not sold (metric tons CaO/metric ton lime).

$MgO_{waste,i}$ = Magnesium oxide content for calcined lime byproduct or waste type i that is not sold (metric tons MgO/metric ton lime).

$M_{waste,i}$ = Annual weight or mass of calcined byproducts or wastes for lime type i that is not sold (tons).

2000/2205 = Conversion factor for tons to metric tons.

(iv) You must calculate annual CO_2 process emissions for all lime kilns using Equation S-4 of this section:

$$E_{CO_2} = \sum_{i=1}^t \sum_{n=1}^{12} (EF_{LIME,i,n} * M_{LIME,i,n}) + \sum_{i=1}^b \sum_{n=1}^{12} EF_{LKD,i,n} * M_{LKD,i,n} + \sum_{i=1}^z E_{waste,i} \quad (\text{Eq. S-4})$$

Where:

E_{CO_2} = Annual CO_2 process emissions from lime production from all lime kilns (metric tons/year).

$EF_{LIME,i,n}$ = Emission factor for lime type i produced, in calendar month n (metric tons CO_2 /ton lime) from Equation S-1 of this section.

$M_{LIME,i,n}$ = Weight or mass of lime type i produced in calendar month n (tons).

$EF_{LKD,i,n}$ = Emission factor of calcined byproducts or wastes sold for lime type i in calendar month n, (metric tons CO_2 /ton byproduct or waste) from Equation S-2 of this section.

$M_{LKD,i,n}$ = Monthly weight or mass of calcined byproducts or waste sold (such as lime kiln dust, LKD) for lime type i in calendar month n (tons).

$E_{waste,i}$ = Annual CO_2 emissions for calcined lime byproduct or waste type i that is not sold (metric tons CO_2) from Equation S-3 of this section.

t = Number of lime types produced

b = Number of calcined byproducts or wastes that are sold.

z = Number of calcined byproducts or wastes that are not sold.

(v) Calculate and report under subpart C of this part (General Stationary Fuel Combustion Sources) the combustion CO_2 emissions from each lime kiln according to the applicable requirements in subpart C.

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§ 98.194 Monitoring and QA/QC requirements.

(a) You must determine the total quantity of each type of lime product that is produced and each calcined byproduct or waste (such as lime kiln dust) that is sold. The quantities of each should be directly measured